Supplemental Material

$PM_{2.5}$ mass concentration measurements

Measurements of $PM_{2.5}$ Mass Concentration Using a Personal Environmental Monitor (PEM)

In order to obtain more accurate $PM_{2.5}$ concentration from the Grimm real-time aerosol spectrometer, the particulate matters were also collected on polytetrafluoroethylene (PTFE) filters with a diameter of 37 mm and a pore size of 2 μm (Whatman Incorporation, Florham Park, NJ, USA). The filters were placed inside a 2.5 μm PEM (SKC Incorporation, Eighty Four, PA, USA), and the air was drawn by an AirChek XR5000 sampling pump (SKC Incorporation, Eighty Four, PA, USA) at 4 L/min.

PTFE filters were conditioned in a temperature (20-25 °C) and humidity controlled (30-40%) room for 48 hours and weighed on a XS105 Dual Range Scale (Mettler Toledo, Columbus, OH, USA) for twice after each 24-hour conditioning period before sampling. If the difference of two measures was more than 0.01 mg, the filter was weighed for a third time after another 24-hour conditioning period. Filters were reconditioned and reweighed with the same procedures after sampling. The average $PM_{2.5}$ mass concentration each day was calculated as (the weight of PTFE filter after sampling - the weight of PTFE filter before sampling) / the air volume sampled.

Calibration of Real-Time $PM_{2.5}$ by PTFE Filter Method

After gravimetric analysis, the averaged $PM_{2.5}$ mass each day was used to calibrate

the real-time mass concentrations of $PM_{2.5}$ as follows:

Calibrated real-time $PM_{2.5}$ concentration = real-time $PM_{2.5}$ concentration × (measured average $PM_{2.5}$ mass concentration/ average real-time $PM_{2.5}$ concentration)

Supplemental Material, Table 1. Estimated percent changes (95% CIs) in 5-minute HRV indices in lagged $PM_{2.5}$ moving averages in two-pollutant models

Variable	Averaging time	With CO	With NO_2	With NO
5-minute SDNN	30-minute	-1.7 (-3.4, -0.1)*	-2.5 (-4.2, -0.8)**	-2.1 (-3.8, -0.3)*
	2-hour	-1.0 (-3.3, 1.4)	-1.4 (-3.7, 0.9)	-0.5 (-2.8, 1.9)
5-minute LF power	30-minute	-3.0 (-6.8, 1.0)	-3.5 (-7.3, 0.6)	-3.6 (-7.6, 0.5)
	2-hour	-3.6 (-8.7, 1.7)	-4.7 (-9.6, 0.5)	-4.7 (-9.7, 0.6)
5-minute HF power	30-minute	-3.6 (-7.2, 0.1)	-4.5 (-8.1, -0.8)*	-4.4 (-8.0, -0.6)*
	2-hour	-5.6 (-10.3, -0.6)*	-6.5 (-11.1, -1.7)**	-5.8 (-10.4, -0.9)*

Effect estimates are given in percent changes for per IQR (69.5 $\mu g/m^3$) increase of $PM_{2.5}$ moving averages, adjusted for age, time of day, $\log_{10}$-transformed heart rate, linear and quadratic terms of moving averages of real-time Temp/RH corresponding to $PM_{2.5}$ moving averages.

*p<0.05, **p<0.01.

Supplemental Material, Table 2. Estimated percent changes (95% CIs) in 5-minute HRV indices for gaseous pollutants

Variable	Averaging time	CO	NO_2	NO
5-minute SDNN	30-minute	-1.2 (-2.1, -0.2)*	0.9 (-3.4, 5.4)	-4.4 (-9.9, 1.5)
	2-hour	-0.4 (-1.8, 1.0)	2.2 (-2.4, 7.0)	-6.0 (-12.2, 0.6)
5-minute LF power	30-minute	0.1 (-2.1, 2.4)	1.9 (-8.8, 13.9)	2.2 (-12.4, 19.2)
	2-hour	-1.9 (-5.0, 1.3)	2.0 (-8.3, 13.4)	0.2 (-14.9, 18.0)
5-minute HF power	30-minute	-1.8 (-3.7, 0.2)	4.0 (-10.4, 20.8)	-0.2 (-18.0, 21.5)
	2-hour	-2.1 (-4.9, 0.9)	2.3 (-11.8, 18.7)	-13.1 (-29.1, 6.4)

Effect estimates are given in percent changes for per IQR (1.5 ppm for CO, 21.1 ppb for NO_2, and 149.2 ppb for NO) increase of each gaseous pollutant, adjusted for age, time of day, $\log_{10}$-transformed heart rate, and corresponding moving averages of real-time Temp/RH in linear and quadratic terms. *p<0.05.

Figure Legend

Supplemental Material, Figure 1. Smoothed curve of the percentage deviation from mean predicted 5-minute HRV indices for 2-hour $PM_{2.5}$ moving average (based on the model with all other covariates adjusted). (A) 5-minute LF power, (B) 5-minute HF power. The 2-hour $PM_{2.5}$ moving average of the turning points for opposite associations of 5-minute LF and HF powers are 57.5 $\mu g/m^3$ and 58.4 $\mu g/m^3$, respectively.

Figure 1. (A)

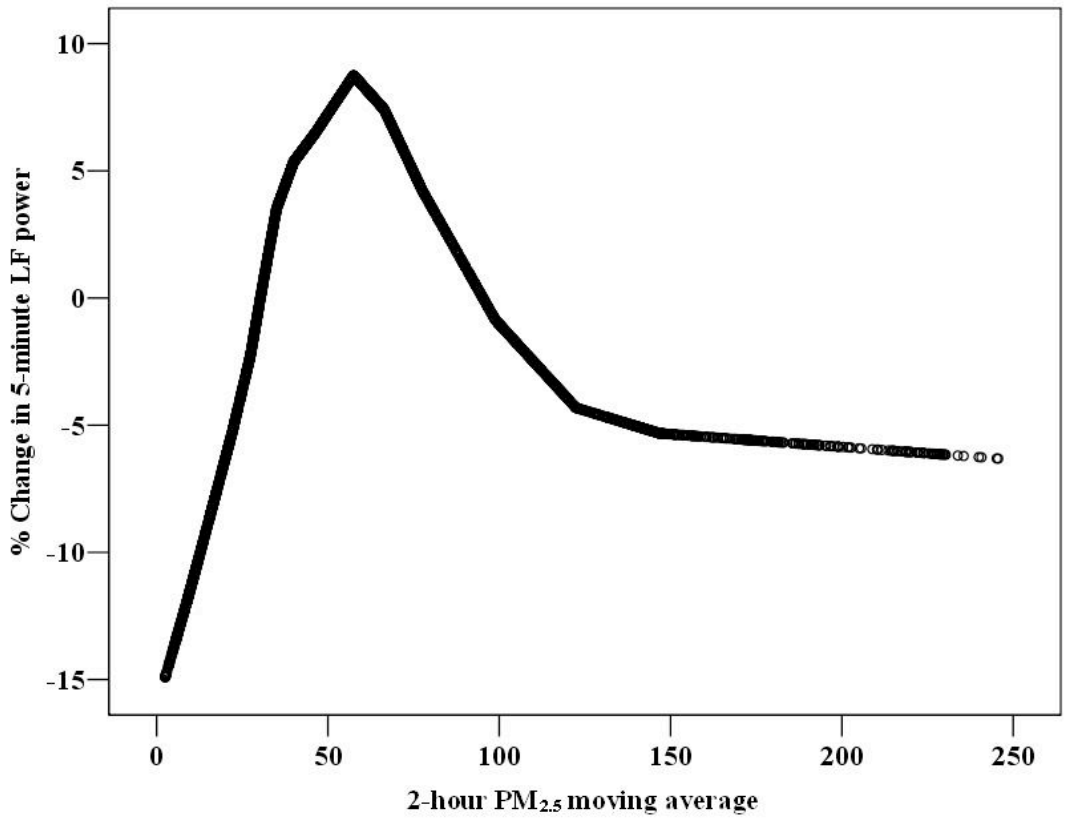
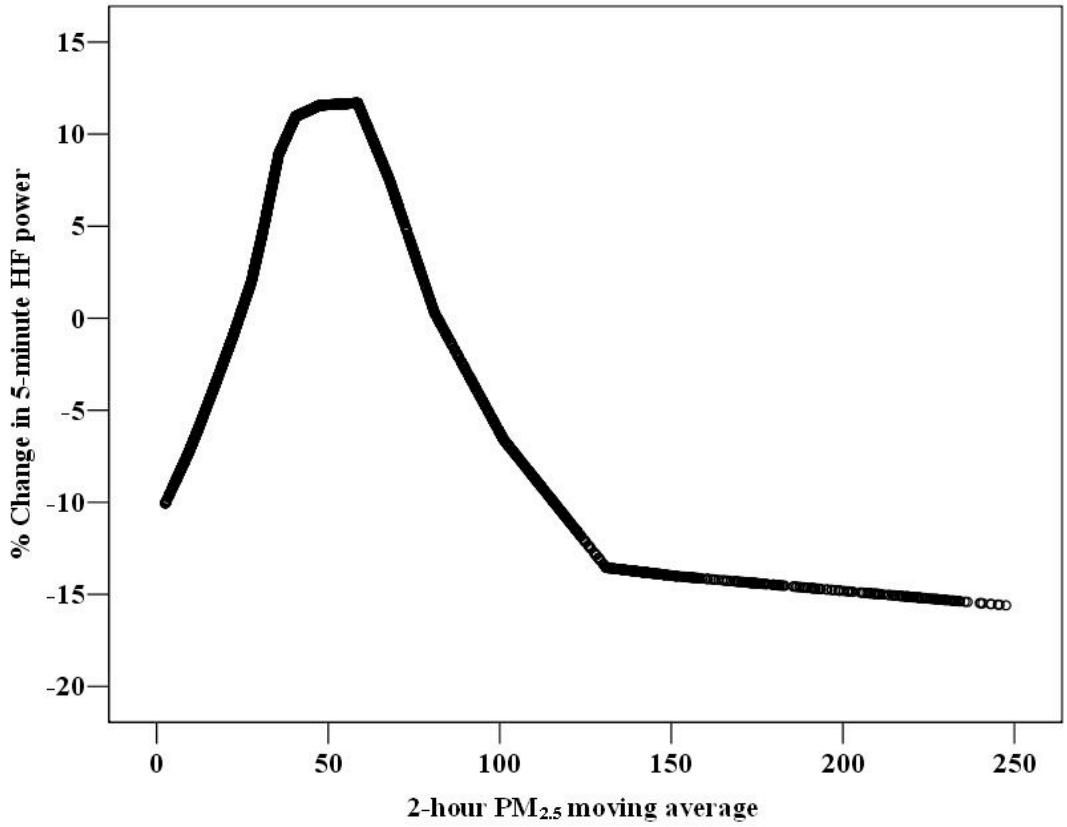

10
5
0
-5
-10
-15
% Change in 5-minute LF power
0
50
100
150
200
250
2-hour PM2.5 moving average

Figure 1. (B)


15
10
5
0
-5
-10
-15
-20
% Change in 5-minute HF power
0
50
100
150
200
250
2-hour PM2.5 moving average